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MINERALOGY AND PETROGRAPHY.[1]

PETROGRAPHICAL NEWS.—Dr. G. H. Williams[2] has identified upon the island of Fernando de Noronha, the following rock types: hornblende-trachyte, trachyte glass, hornblende-andesite, phonolite, nepheline rocks, augitite, limburgite and basaltic bombs and tuffs. In the phonolites, ægerine occurs both in porphyritic crystals and in the groundmass. In the crystals of the groundmass the inclination of the axis of greatest elasticity to the vertical axis is 7° 42′—16°. Their pleochroism is $B =$ green, $A =$ green, $C =$ yellow. Among the nepheline rocks are basanites, dolerites and basalts. In the dolerites are brownish-red augite crystals which are distinctly pleochroic in reddish-brown and greenish-yellow tints. They are zonarly developed with the exterior zones more highly colored than the interior ones.—A recent article by E. S. Dana[3] in the petrography of the Sandwich Islands is so full of interesting statements that a brief review of it is very unsatisfactory. The lavas of Mauna Loa and of Kelauea are of the same general character. They are basalts and olivine-basalts in numerous varieties. A fine-grained clinkstone-like basalt from Loa is remarkable for the beautiful feather-like groupings of augite microlites discovered in all specimens examined. Many of the augite microlites are intergrown with lath-shaped crystals of plagioclase, the two minerals radiating from a common center, and the latter often capping the tufts of the former. The olivine-basalt from the same crater contains many crystals of olivine in peculiar forms, some of which are slender acicular crystals elongated in the direction of their c axes. They often possess an unusually deep green color, when they show strong pleochroism. In the Mt. Loa lava streams are caverns from whose walls delicate stalactites of lava project. These are described by the author in great detail and are pictured with great minuteness. The stalactites are often solid throughout and possess a concentric structure. They are crystalline, except on the outside, where they are covered with a thin coating of glass, transversely marked with fine flowage lines. Frequently a large portion of the volume of a stalactite consists of cavities, whose walls are lined with large rhombic scales of clear plagioclase, needles of augite and octhedra of magnetite. The lavas of the island of Maui and of Ohua are also principally olivine-basalts, in which augite is often zonally grown around olivine crystals. In the western portion of Maui is a whitish-gray compact rock, composed almost exclusively of plagioclase, with a very little altered hornblende, brolite and magnetite. Since it contains 61.63% of SiO_2 it is probably to be referred to the andesites.—An interesting communication by Rutley on the possible origin of epidosites appears in the Quarterly Journal of the Geological Society.[1] Altered felsites with a perlitic structure occur near the Hereford Beacon, Malvern Hills. The rock is gray in color, and is traversed by a delicate network of quartz veins containing epidote grains and curved lines of epidote, which by their green color and strong double refraction mark out the direction of formerly existing perlitic cracks.[2] The epidote is thought to have originated from the feldspar of the felsites, either directly or indirectly through the interposition of kaolin by the action of solutions of carbonates of calcium and iron, which would naturally circulate most readily through the perlitic cracks. By a continuation of this process epidosites might arise through the entire change of the material of the felsite into epidote and quartz.—The ejectamenta thrown out by Vulcano have recently been studied by Johnston-Lavis.[3] The most abundant products of this volcano are bombs whose surfaces are broken by fissures, and pieces of foreign rocks. The material of the bombs is obsidian, containing as inclusions pieces of basic rocks, and minerals resulting from these by alteration. The ashes accompanying these bombs consist of fragments of basic and acid glassy rocks, which the author believes to have been broken from the sides of the volcanic vent. The existence of pyrites in the material of the bombs, as well as the presence in it of olivine and augite with perfectly sharp angles, leads to the conclusion that the temperature of the lava from which the bombs were formed was low.—The obermittweide conglomerate from a point in the Mittweide valley, twenty-five miles south of Chemnitz, has been subjected to investigation by Bonney,[4] who finds the matrix to have been derived largely from the detritus of a biotite granite, and to have undergone such alteration that it may now be regarded as crystalline. It consists of quartz, two micas, and a little feldspar. The constituents exhibit a slight tendency to parallelism, but show little evidence of squeezing.—The same writer[1] announces the discovery of a variety of picrite, known as scyelite, on the island of Sark in the British Channel. It is composed of serpentinized olivine, altered augite and bleached mica, some of which exhibits a banded twinned structure, one set of bands extinguishing parallel to the cleavage of the mineral, and the second band 18° to this cleavage. The rock was not found in place.—Joly[2] has discovered the presence of iolite in a feldspathic substance associated with beryl in the granite of Glencullen Co., Dublin, Ireland.—Upon treating the quartz-porphyry from Teplitz with hydrofluoric and sulphuric acids, von Foullon[3] obtained in the residue little grains of corundum.

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[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

[2] *Am. Jour. Sci.* March, 1889, p. 178.

[3] Ib. June, 1889, p. 441.

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[1] November, 1888. p. 740.

[2] Am. Nat., 1887, p. 1112, where it is stated that the author regarded the mineral filling the cracks as topaz.

[3] Nature, p. 111.

[4] Quart. Jour. Geol. Soc., 1888, No. 173, p. 25

MISCELLANEOUS.—In a little pamphlet entitled "Ueber das Verhalten der Silicate beim Uebergange aus dem gluthflüssigen in den festen Aggregatzustand," Nies[4] discusses the occurrence of crystals of silicates in lava streams, describes the action of water, metals, and alloys in passing from the solid to the liquid state, calls attention to the contraction forms in eruptive rocks, and concludes that silicates probably expand upon their crystallization from a molten magma, and do not contract as has been generally stated, but that not enough facts are known to warrant a positive statement on either side. The apparent contraction is due to the fact that the specific gravities of crystallized and amorphous bodies have been taken while both were cold, and, therefore, that they can not be regarded as criteria upon which to base conclusions as to the relations of the substances in the two different conditions at a high temperature. Their different relations at a higher temperature are due to the more rapid expansion of crystalline substances than of amorphous ones.—An interesting contribution to the study of morphotropism has recently been made by Dufet,[5] who has carefully investigated the mixed crystals produced upon the evaporation of a solution of zinc and magnesium sulphates. As a result of his measurements of certain

[1] Geol. Magazine, March, 1889, p. 109.

[2] Geological Magazine, 1888, p. 517.

[3] Verh. I. k. k. geol. Reichsanst. 1888. No. 8, p

[4] Stuttgart. 1888. Schweizerbartsche Verlagshand.

[5] Bull. Soc. Franç. I Min. xii. p. 22.

interfacial angles he concludes that the values of these are the means of the values of those of the two simple sulphates, calculated in the proportions of their molecular combinations. The author proposes to study other mixed salts in the same way. McMahon[1] makes use of a thin quartz wedge for the determination of the strength of the double refraction of minerals in their rock sections. The quartz wedge is inserted between the crossed nicols of a microscope at an angle of 45° to their planes of polarization, and the point is noted at which there is no double refraction apparent when the object under investigation is placed on the microscope stage. This point of no double refraction is indicated by a dark line crossing the field. Its position varies with the strength of the double refraction of the mineral, so that by comparing its distance from the end of the quartz wedge with the distance observed in the case of minerals of known strength a ready means is afforded for a rapid determination of its double refraction.

Heririg[2] mentions the existence of a grotto in the Waschgang Mine at Döllach in Corinthia, whose walls are covered with well formed ice crystals, some measuring as much as 200 mm. in diameter.—Fulgurite glass from lightning tubes in a glaucophane epidote schist, in which occur yellow garnets, sphene, and occasionally diallage, is described by Rutley from the top of Monte Viso. The interesting fact in connection with this fulgurite is the existence in the tubes of a vesicular glass in which gas bubbles, and globulites and microlites are scattered.

In an article entitled the "Physics of Metamorphism," Harker[4] calls attention to the influence of pressure in effecting changes in the character of rock masses, and divides metamorphism into hydrothermal dynamo, and plutonic metamorphism, the meaning of each of which terms he explains in some detail In a red copper slag from the Canton Copper Works, Baltimore, Messrs. Jarman and McCaleb[5] have discovered cuprite in little octahedral crystals.

MINERALOGICAL NEWS.—Much additional[6] knowledge in regard to the sulphates occurring near Copiapo, Chili, has been gathered by Luck,[1] who has made an extensive crystallographic and chemical study of them. *Coquimbite* is declared to be rhombohedrally hemihedral with $a : c = 1 : 1.5613$. Its hardness is 2—2.5 and specific gravity = 2.079—2.114. *Copiapite* has been determined to be monoclinic with $a : b : c = .4791 : 1 : .9759$ and $\beta = 71° 56'$. The mineral cleaves parallel to $\infty P \infty'$ and $\frac{4}{9} P\bar{\infty}$. Its hardness is 2.5 and specific gravity 2.103. Analysis yielded:

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[1] Geological Magazine 1888, p. 548.

[2] Zeits. f. Kryst. xiv. p. 237.

[3] Quart. Jour. Geol. Soc., Feb. 1889, p. 60, and Geol. Mag., 1889, p. 42.

[4] Quart. Jour. Geol. Soc., 1889, p. 15.

[5] Amer. Chem. Jour. Vol. II., p. 30.

[6] AMERICAN NATURALIST, 1888, pp. 930 and 1022.

SO_3	Fe_2O_3	Ae_2O_3	CaO	H_2O
38.91	30.11	tr.		30.74,

corresponding to $Fe_4 (HO)_2 (SO_4)_5 + 18$ Aq. *Stypticite* occurs in radially fibrous aggregates of a yellowish-green color. Its hardness is 2.5 and specific gravity 1.857. Its crystalization is probably monoclinic. Its composition was found to correspond to $Fe_2 (OH)_2 (SO_4)_2 + 9$ Aq. Upon alteration it gives rise to a grayish-yellow substance what is probably identical with *fibro ferrite.* Tabular crystals of *römerite* and found to be triclinic with $a : b : c = .9681 : 1 : 2.6329$ and $\alpha = 116° 2' : \beta = 94° 41' : \gamma = 80° 8'$. Its cleavage is basic, hardness 3 and specific gravity 2.102. An analysis of pure material leads Linck to regard the mineral as $Fe (Fe Al)_2 (SO_4)_4 + 15$ Aq. Chilian *halotrichite* yielded on analysis:

SO_3	Ae_2O_3	Fe_2O_3	FeO	CaO	MgO	H_2O
33.98	10.43	.95	5.55	.69	.78	46.94

Among these sulphates is one occuring in reddish-violet, tabular crystals, in habit resembling gypsum crystals. It is monoclinic with $a : b : c = .3942 : 1 : .4060$. $\beta = 77° 58'$. Most of the crystals are elongated in the direction of the clino diagonal. The plane of the optical axes is in $\infty P \infty'$ and the first bisected is inclined to c in the obtuse angle β. The the double refraction is negative, hardness 2.5, specific gravity 2.1155. Its composition is

SO_3	Fe_2O_3	Al_2O_3	CaO	MgO	H_2O
39.83	27.66	tr.	.40	tr.	31.35

corresponding to $Fe_2 (SO_4)_3 + 10$ Aq. The author calls the mineral *quenstedite.*—Some interesting pyrite crystals are described by Mr. W. B. Smith[2] from the mines in Gilpin and Summit counties, Colorado. The crystals from the Saratoga mine in the former county are remarkable for the large number of forms occuring upon them. Interpenetrating crystals with the twinning axis normal to ∞O, consist of modified cubes, which are brought into such a position by twinning that the striations on parallel cubic faces cross each other at right angles. Other crystals contain on their cubic faces striations that appear to be discontinuous. The crystals are probably contact tronis with $\infty O \infty$ the composition face. The crystals from Summit county occur in almost ideal perfection in a mass of kaolin in the vicinity of Monte Zuma. *Alabandite* from the Queen of the West mine in Summit county, *manganite* from Devil's Head, Douglas county, crystals of *dioptase* ($\infty P2$ and $-2R$) from near Riverside, P.O., Arizona, and *garnets* from Chaffee county, Col., are also described by the same mineralogist. Repeated trillings of *vanadinite* from the Alice mine, Yuma county, Arizona, consist of crystals united by their prismatic faces and therefore resembling simple crystals. These groups of three crystals sometimes enclose a hollow triangular space running longitudinally through the center of the group. In a lot of *wulfenite* crystals from the Red Cloud mine in Yuma county were found a few tronis with the composition plane ∞P. They produce elbow-shaped forms with the two limbs bent at right angles to each other. Fine *quartz* and *epidote* crystals, all of the latter of which are twinned parallel to ∞P occur in pockets in a peculiar rock composed of epidote, calcite and pyroxene, overlying a stratum of limestone at Calumet, Col. Some new facts are stated regarding the *phenacite* from Mt. Antero, and a new locality for the mineral is mentioned as existing half a mile distant from the locality already known. In the second place, the phenacites have a rhombohedral habit in consequence of the development of a rhombohedron of the third order. The pocket in which these crystals are found contains also many Baveno twins of white microline upon which most of the phenacite was implanted.—The *feldspar* of the nepheline and lencite basamites of Kilimandjaro examined by Fletcher a year or so ago[1] has been re-examined by Hyland[2]. The fresh mineral is pearl-gray in color, with a light vitreous lustre. Crystals containing the faces oP, $\infty P \breve{\infty}$ are twinned parallel to $\infty P \bar{\infty}$, with this face also as the combination plane. In some of these an interior, twinned nucleus is surrounded by a zone of untwinned material, which can be removed from the former by mechanical means so as to leave a kernel with the shape of a Carlsbad twin. The cleavage of the mineral parallel to oP and $\infty P' \breve{\infty}$ are inclined to each other at an angle of 90° 3′. Between crossed nicols plates cut parallel to oP show twinning lamellæ of variable breadth extinguishing at 1°—3½°. Sections parallel to $\infty P \breve{\infty}$ possess an extinction of 5°—6°. A chemical examination of purified material gave:

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[1] Zeits J. Kryst. xv. p. 1.

[2] Proc. Colorado Scient. Soc. 1887, pp. 155 and 17

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[1] American Naturalist, 1888, p. 930.

[2] Geological Magazine, April, 1889, p. 160.

SiO_2	Al_2O_3	CaO	K_2O	Na_2O	H_2O	Sp. Gr.
61.35	23.10	3.02	5.34	7.11	.09	2.63

Its composition corresponds to $An_1\ Or_{2\cdot1}\ Ab_{4\cdot02}$. Since the mineral is undoubtedly triclinic Hyland would call it *soda microcline* as suggested by Brögger.—Intermingled with a few notes on new occurrences of minerals in Pennsylvania and New Jersey, Mr. Eyerman[1] records the analysis of *calamine* from Friedensville, N. J., and of *apophyllite* from St. Peter's, Chester Co., Pa., as follows:

	SiO_2	Fe_2O_3	QnO	CaO	K_2O	H_2O
Calamine,	24.32	2.12	65.05			7.86
Apophyllite,	51.63			25.42	6.25	16.58

—The same writer[2] describes large crystals of *pyrite, chalcopyrite, apophyllite, stilbite, garnet* and smaller crystals of *calcite, orthoclase, pyroxene, aragonite,* masses of *pyrallolite* and *erythrite* and needles of *byssolite* in calcite, all from the shafts of a magnetic mine at French Creek, Pa. The stilbite gave on analysis:

SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	K_2O	Na_2O	H_2O
58.00	13.40	tr.	7.80	1.40	1.03	tr.	18.30

—Abnormally developed crystals of *pyrite* from these mines are mentioned by Mr. Penfield[3] as being lengthened in the direction of one of their axes as to present tetragonal symmetry with all the planes terminating at the extremity of the extended axis curved. The crystals are either simple octahedra or octahedra in combination with pyrotoid faces. It is thought that the abnormality may be due to the development of the planes of the form $\frac{3}{2}$ O.—Crystals of *gypsum* from the salt marshes of Batz, Loire-Infèrieur, France, are so associated

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· Notes on Geology and Mineralogy, Proc. Acad. Nat. Sci., Phila. Feb. 26, 1889, p. 32-35.

[2] On the Mineralogy of the French Creek Mines in Pennsylvania. Read before the N. Y. Acad. of Sciences, Jan. 14, 1889.

[3] *Amer. Jour. Science*, March, 1889, p. 209.

with iron pyrites and organic calcium carbonate, as to leave no doubt[1] that they have been produced by the action of these two substances upon each other.—Messrs. Clark and Catlett[2] have discovered small quantities of platinum in a mass of sulphide of nickel, iron and copper from the copper mines at Sudbury, Ontario. The principal sulphide in the mass is the rare mineral *polydymite* $(NiFe_4)S_5$.—Mallard[3] has measured the index of refraction for yellow light in the rare mineral *sellaite* from the vicinity of Montiers, and finds $\varepsilon = 1.389$ and $\omega = 1.379$.—Cruciform twins of *thenardite* from Borax Lake, Cal., are stated by Mr. Ayres[4] to have $P\breve{\infty}$ as their twinning plane.—Jannash and Calb[5] have analyzed a large number of specimens of tourmaline, and have reached the same conclusion with reference to the composition of the mineral as was reached by Riggs[6] about a year ago.

PSYCHOLOGY.

THE SENSE OF SMELL IN DOGS.—Under this title Dr. George J. Romanes read a paper at the meeting of the Lumean Society of London, December 16, 1886. After preliminary observations on the faculties of special sense generally, and in particular that of smell, as enormously developed in Carnivora and Ruminantia, the author related his own experiments with a setter bitch. His conclusions are that in the case of this animal she distinguished his trail from that of all others by the peculiar smell of his boots, and not by the peculiar smell of his feet. "No doubt the smell which she recognized as belonging distinctively to my trail, was communicated to my boots by the exudations of my feet; but these exudations required to be combined with shoe leather before they were recognized by her. Moreover, it may be inferred that if I had always been accustomed to hunt without boots or stockings she would have learned to associate with me a trail made by my bare feet. The experiments further show that although a few square millimetres of the surface of

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[1] Bull. d. l. Soc. Franc. O. Min., xi., p. 295.

[2] *Amer. Jour. Sci.*, May, 1889, p. 372.

[3] Bull. Soc. Franc. d. Min., xl., p. 302.

[4] *Amer. Jour. Science*, March, 1889, p. 235.

[5] Ber. d. deutsch. Chem. Ges., 1889, p. 216.

AMERICAN NATURALIST, 1888, p. 250.